



## Comparing LCD, Plasma, and Projector display technologies.

Plasma and LCD TVs have finally hit their stride. Major electronics stores have all but phased out the old CRT televisions, relegating them to the unseen corners. Meanwhile, hordes of consumers are forced to make choices between two new technologies that they know little of. Of course you have the helpful sales associates giving out their advice. But without background information they may be able to take you for a ride. They may sell you something not quite right for you, or may forget to mention possible alternatives if they don't carry them.

Comparison	Plasma televisions	LCD televisions	Front Projectors	Advantage
<b>Screen Size</b>	Average screen sizes range from 32 inches to 63 inches (measured on the diagonal). Larger plasmas, like a 103 inch unit from Panasonic, are in production, but are still prohibitively expensive for consumer use. Panasonic has announced plans to release a 150-inch plasma display by 2010.	Average screen sizes range from 13 inches to 65 inches (measured on the diagonal). As with plasma, there are larger LCD TVs made, like a 108 inch display which is to be released in later this year (2008) by Sharp, but they are not readily available or affordable at the consumer level.	Typical screen sizes from as small as 40 inches to as large as 300 inches (measured on the diagonal). Projectors do not have a fixed image size so most projectors list their screen size as a range (i.e. 40-300 inches. Most buyers opt for sizes from 76-inches to 120-inches if they purchase a screen. Optimally the image should not be over 300-inches.	Front projectors are able to create the largest images by far. Projectors are also the only option which is not a fixed size (meaning your screen size can change if desired) and projectors are also more portable than an LCD or Plasma. Plasma and LCD TVs are comparable in size now with the maximum sizes over 60-inches. Maximum recommended projector image sizes are around 300-inches.
<b>Viewing Angle</b>	Up to 178°. Plasma images do not suffer from the same degradation at higher viewing angles that LCD TVs do because of the nature of the technology.	Up to 175°. LCD TVs were originally designed for a one user experience, as a computer monitor. As the applications for the technology grew for larger to larger displays and audiences, an issue with viewing angles emerged. Although the LCD TV can be viewed from up to 176 degrees, there is a "sweet spot" which will produce brighter, higher contrast images.	Viewing angles are not an issue with front projectors because the light source is coming from in front of the screen, and not from behind. The surface on which you project (screen or wall surface) may have a slight impact on viewing angles.	Unlike rear projection TVs, front projectors do not have an issue with viewing angles, so they have the advantage here. Between LCD and Plasma; Plasma TVs have the advantage, but by a small margin. However, your viewing experience won't be ideal at 160 or 175 degree angles for any technology.

<p><b>Screen Refresh Rates / Pixel response time</b></p>	<p>Plasma displays refresh and handle rapid movements in video about as well as CRT televisions, which is about the standard most viewers expect.</p>	<p>LCD TVs were originally designed for static data display, and not moving video. Therefore refresh rates had to be improved. LCD TVs with refresh rates below 16 ms or lower (5-15 ms) show very few noticeable artifacts. LCD TVs are now available with refresh rates specified by manufacturers as low as 5ms.</p>	<p>Projectors designed for home theater use will handle video better than a projector designed for business (though there are some good cross-over projectors on the market). Response time is not usually specified by projector manufacturers so it is difficult to compare directly to LCD and plasmas by comparing specs.</p>	<p>Plasma still specs faster than LCD for pixel response time, however LCD has closed the gap significantly in the past 3 years or so. For most consumers, projectors, plasma and LCD displays will have sufficient response times. For video gamers, or others to whom instantaneous response is a must, the lower the 'ms' spec...the better.</p>
<p><b>Burn-in or Stuck Pixels</b></p>	<p>Plasma TVs can suffer from burn-in produced by static images. After extended periods, stationary images "burn in" and produce an after-image ghost which remains permanently on the screen. With technologies such as 'pixel orbitor,' new plasma TVs have addressed burn-in and significantly reduced the issues of older models.</p>	<p>LCD TVs do not suffer from burn-in, but can have a "retained pixel charge" which may also produce ghosting. Stuck pixels are also possible with an LCD display.</p>	<p>Projectors can suffer from dead pixels, though there are some manufacturers with a 'zero dead pixel' warranty. The bigger concern for projector buyers is lamp life. After long term use, the projected image will not be as bright as it was over the first few hundred hours. Lamps are replaceable, however, and cost between \$200 - \$400.</p>	<p>There is no clear winner here. Manufacturers of each technology have worked hard to minimize issues. If stuck pixels or burn in are major concerns for you, check the manufacturer warranty for their return or repair policies. Some manufacturers offer a 'zero dead pixel policy' and others will repair or replace products with pixels out in the 'sweet spot' of your picture.</p>
<p><b>Product Life-span</b></p>	<p>Plasma TVs have a reported half life of 30,000 to 60,000 hours. Half-life is the time it takes the lamp to fade to half its original brightness. Panasonic recently reported life span's approaching 100,000 hours.</p>	<p>LCD TVs have a backlight that is specified to last between 30,000 and 60,000 hours. LCD TVs also have replaceable backlights, but the expense of replacing one when the time comes may be greater than simply replacing the entire TV.</p>	<p>Projectors have lamps that last up to 5000 hours (usually when operated in a low-power mode). Projector lamps are replaceable, and cost up to approximately \$400. Projector lamps can be changed more than once. A projector may not be the best choice for everyday viewing, but it is the best value by cost per viewing inch for a home theater.</p>	<p>Both Plasma and LCD technology should more than adequately satisfy most consumers. The average CRT TV (the kind most of us have at home) has a half-life of around 25,000 hours. If the average American household watches an average of four to six hours of television a day, even a 30,000 hour backlight would give you over 16 years of use. By then you'll be enjoying your new 'Holodeck.' A video projector has a shorter lamp life, but the lamp can be replaced multiple times. Projectors are better suited for a dedicated home theater</p>



<b>Weight</b>	Plasma displays are fairly heavy, and may need additional supports to be mounted onto a wall.	LCD TVs weigh less than comparably sized plasma TVs.	Single chip DLP and 3LCD projectors typically weigh between 10 - 20 lbs. They can be shipped for less than an LCD or Plasma TV over 19-inches in most cases.	Projectors are lighter and less bulky to ship and to install than an LCD or Plasma TV. Projection screens are bulky and large however. LCD TVs are second least heavy, followed by plasma.
<b>Durability</b>	Plasmas are somewhat fragile making them tricky to ship and install. Unlike the commercials where plasmas are mounted on the ceiling, plasmas are best installed by a professional, and should be installed on a wall that can bear a good deal of weight. However, recent improvements to plasma screens have made them significantly more durable and lighter weight.	Somewhat more durable than older plasmas. End users can easily mount an LCD TV themselves if desired, although LCD TVs should still be shipped with special care, and the screen itself should be cleaned with a streak free cleaner.	Projection surfaces vary, but a wall or screen are obviously less fragile than an LCD or Plasma TV. Screens can be washed and walls can be repainted. The projector itself is also as durable as either a Plasma or LCD TV.	A projector screen is durable and cleanable, and walls can be painted. Projectors are also very durable. Because of this, projectors win this battle, with LCD TVs in second place, followed by plasma.
<b>Shipping</b>	Due to their fragile nature, plasma TVs need to be shipped by specialty carriers. Overnight or fast delivery options are not recommended. Special shipping methods and their heavier weight add to higher shipping costs.	Shipping LCD TVs is not difficult, and is not as expensive as shipping plasma displays.	Single chip DLP and 3LCD projectors typically weigh between 10 - 20 lbs. They can usually be shipped for less than most LCD or Plasma TVs over 19-inches.	Projectors are cheaper and safer to ship overall. If you purchase a screen, that will add significantly to the cost of shipping. In some cases, whether an LCD, plasma, or projector, the shipping will be paid by the reseller. Plasma's are typically heavier and may require that you ship them on a pallet, adding to the cost of shipping.
<b>Installation</b>	Plasmas are heavier, use more power, and run hotter than LCD TVs, and therefore require more planning when mounting them. Plasmas are generally best installed by professionals.	End users can easily install LCD TVs themselves, or can use them just as they use a traditional TV using a stand.	Depending on how polished you want your home theater to be, a projector can be very easy to set up, or can be a longer and more involved installation. Projectors are lightweight, and can be removed from an installed location and used in other applications - like a make shift outdoor theater.	LCD TVs are easier to install than plasmas because they weigh less. Most TVs sold in the consumer market will come with a stand. Projectors are a more complicated installation than either a plasma or LCD TV when they are ceiling mounted. TVs with a stand and projectors set on a table top require similar efforts to set up.

<b>Brightness / Contrast</b>	<p>Plasma TVs report higher brightness and contrast levels than LCDs. Under ideal conditions (no ambient light) this is a true advantage of plasma technology, because LCD TVs are backlit and therefore light must be blocked to create blacks. Plasmas have individual pixels that either on or off, creating deeper blacks and better contrast.</p>	<p>LCD TVs can often look better in 'real-world' situations. Plasmas are made with a special glass surface that can reflect light, which dulls the brightness and contrast of the image. LCD TVs reflect very little light, allowing them to maintain levels in well-lit rooms.</p>	<p>Projectors now have contrast ratios of 50,000:1 and higher, making them nearly equal by specification to many LCD and plasma TVs. However, with ambient light in a room, contrast and brightness can be significantly impacted. For best contrast that rivals LCD and plasma, low light or no light environments are best. Different specifications are used to measure brightness in a projector, so it is difficult to compare directly.</p>	<p>Just about any LCD TV or plasma will satisfy the expectations of most consumers need for brightness and contrast. Videophiles will look for the highest contrast ratios and will likely ignore the brightness specs on an LCD or plasma TV. Newer home theater projectors (1000 ANSI lumens or brighter) should also satisfy in any controlled lighting environment. Projectors are not ideal for rooms with a lot of ambient light unless they have more than 2000 lumens of brightness.</p>
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<b>Thickness</b>	<p>As thin as 3 inches deep.</p>	<p>As thin as 2 inches deep.</p>	<p>Projectors are simply projecting light onto a surface, so on a screen or wall the image will not take up much space. The projector itself will need to be placed on a flat surface or mounted out of the way.</p>	<p>The projected image is (obviously) very thin, and create a truly 'flat' image. LCDs TVs and plasma's are just about equal to each other in thickness (around 2-3 inches, and for most this is not an issue. But a projector is the solution that can be easily stored away out of site (using a retractable or portable screen).</p>
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<b>Performance at High Altitude</b>	<p>High altitudes can affect the performance of plasma displays because the gas held inside each pixel is stressed, and has to work harder to perform. Some manufacturers make plasmas that are specifically designed for high-altitudes, but they may be priced higher than standard models.</p>	<p>LCD TVs are not affected by high altitudes.</p>	<p>Most projectors are only minimally affected by altitude. The one difficulty with projectors will be a more active fan, which may make the projector run slightly louder.</p>	<p>LCD TVs or projectors have the advantage. New plasmas and projectors have evolved with new methods of dealing with the altitude issues. Ask your sales person for details if you live in a high altitude.</p>
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